

## REMARKS

1. Claims 1-30 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lauritzen et al US 4,808,738 (hereinafter the '738 publication) in view of Shell WO 95/17957 (hereinafter the '957 publication), Evans et al US 5,418,202 (hereinafter the '202 publication), and Lauritzen et al EP 00352850 (hereinafter the '850 publication) in further view of Habenschuss et al CA 1286687 (hereinafter the '687 publication), Baker et al EP 1458698 (hereinafter the '698 publication), Carlson CA 488990 (hereinafter the '990 publication) and Evans WO 01/96324 (hereinafter the '324 publication). This rejection is respectfully traversed.

The Examiner cites EP 1458698 against claims 1-30; however, Applicants believe the publication is not a proper reference under 35 U.S.C. 103(a) since the date of publication is September 22, 2004 which is after the effective filing date of the present application. Further, Applicants believe International Publication No. WO 2003/044002, from which EP 1458698 originates, is also not available as a reference under 35 U.S.C. 103(a) since a statement of obligation of assignment under 35 U.S.C. 103(c)(1) accompanies this Response.

Applicants' adhere to the remarks/arguments made in the prior Response, dated October 26, 2006, and those remarks/arguments are hereby incorporated by reference. The following paragraphs are intended to further elaborate on the remarks/arguments already given.

The present invention relates to epoxidation catalysts containing a relatively small quantity of a rhenium component, as defined in the claims. It has been found that the catalysts of the present invention retain their selectivity better, such that after a certain period of use they outperform the catalysts which comprise more rhenium and accordingly have a longer service life. *Application Text*, page 4, lines 11-27.

A limitation of claim 1 is that during the epoxidation process the reaction temperature is increased to at least partly reduce the effect of loss of activity of the catalyst while the organic halide is present in a relative quantity Q which is maintained constant, which relative quantity Q is the ratio of an effective molar quantity of active halogen species present in the feed to an effective molar quantity of hydrocarbons present in the feed.

The Examiner states: “[I]t is well recognized that ‘reaction systems generally deactivate over time, i.e., the activity of the catalyst begins to decrease as the process is carried out.’ To overcome this it is known [to] increase the temperature of the reaction at a rate to maintain a given activity. See Habenschuss et al CA 1286687 page 6 last paragraph and page 7 first paragraph. See also Carlson CA 488990 page 4 lines 18-24.” *Office Action*, dated January 31, 2007, page 3, 1<sup>st</sup> paragraph. The ‘990 publication at page 4 lines 18-24 discusses attaining and maintaining a desired reaction temperature using any suitable means to supply or withdraw heat and does not discuss catalyst deactivation and increasing the reaction temperature to maintain activity. The ‘687 publication does disclose increasing the reaction temperature to compensate for the deactivation of a catalyst. However, the ‘687 publication does not teach or suggest increasing the temperature to at least partly reduce the effect of loss of activity of a catalyst, as defined in the claims, while the organic halide is present in a relative quantity Q which is maintained constant. The relative quantity Q being the ratio of an effective molar quantity of active halogen species present in the feed to an effective molar quantity of hydrocarbons present in the feed.

The Examiner further states: “It is also noted that Evans teaches continuously adjusting the chlorohydrocarbon during the reaction to maintain a certain activity level. The same is also taught by Carlson CA 488990. See page 4 lines 10-12.” *Office Action*, dated January 31, 2007, page 3, 2<sup>nd</sup> paragraph.

The ‘990 publication describes using a small amount (i.e., in the range of from 0.1 to 3 ppmv) of ethylene dichloride moderator with a conventional silver catalyst to allow use of higher operating temperatures while improving the ethylene oxide conversion and yield. *Canadian Patent No. 488990*, page 3, lines 3-12. The ‘990 publication does not disclose continuously adjusting the moderator during the reaction to maintain a certain catalytic performance.

The ‘324 publication does disclose repeatedly optimizing the concentration of moderator during the operation of a highly selective catalyst; however, the moderator is adjusted in order to maintain the optimal selectivity. The ‘324 publication also discloses the concentration of the moderator can remain the same during the entire lifespan of a

conventional catalyst unlike a highly selective catalyst. *PCT International Application Publication No. WO 01/96324*, page 8, lines 5-16.

Both the '324 publication and the '850 publication teach changing the chlorohydrocarbon moderator level over the period of operation of a highly selective catalyst containing silver and rhenium. *See PCT International Application Publication No. WO 01/96324*, page 8, lines 5-16 and *European Patent No. 352850*, page 2, lines 30-48. In particular, the '850 publication teaches increasing the chlorohydrocarbon moderator during the period of operation of the highly selective catalyst. However, increasing the concentration of the chlorohydrocarbon in the feed leads to a higher relative quantity Q when the other components in the feed are kept constant as done in the examples of the '850 publication. The '324 publication and the '850 publication teach away from increasing the reaction temperature to at least partly reduce the effect of loss of activity of the catalyst while the organic halide is present in a relative quantity Q which is maintained constant.

Therefore, there is no reason to modify or combine the '738, '957, '202, '850, '687, '990, and '324 publications to arrive at the present invention.

Further, as demonstrated in Example 2 and Table II of the application text as filed, a catalyst having a low rhenium content as defined in the claims unexpectedly has an increased service life and eventually a higher selectivity when operated in an olefin epoxidation process at a constant value of relative quantity Q as compared to a catalyst which has a higher rhenium content and higher initial selectivity operated at increasing values of relative quantity Q.

In Example 2, at a cumulative ethylene oxide production of 1.5 kT/m<sup>3</sup>, the selectivity for Catalyst F was 80 mole-% with a reaction temperature of 285 degrees Celsius. It is noted that after a cumulative ethylene oxide production of 0.81 kT/m<sup>3</sup>, Catalyst F was no longer operated at 2.25 %v ethylene oxide content in the outlet gas stream because of severe deactivation and instead was operated at the conditions of 1.5-2 %v ethylene oxide content in the outlet gas stream. At a cumulative ethylene oxide production of 1.6 kT/m<sup>3</sup>, the selectivity for Catalyst A, in accordance with the invention, was 81 mole-% with a reaction temperature of 270 degrees Celsius, and the selectivity for Catalyst B, also in accordance with the invention, was 81 mole-% with a reaction

temperature of 269 degrees Celsius. This improvement in catalyst performance is especially unexpected in light of the '850 publication which teaches that for a highly selective catalyst an improvement in stability is obtained by increasing the chlorohydrocarbon moderator level over the period of operation of the catalyst.

*European Patent No. 352850, page 2, lines 38-39.*

In view of these arguments, Applicants respectfully request that the rejection be withdrawn.

**CONCLUSION**

The rejections having been traversed, allowance of the claims of the present application is respectfully requested. If the Examiner would like to discuss this case with Applicants' attorney, the Examiner is invited to contact Lisa Holthus at the phone number below.

Respectfully submitted,

MAREK MATUSZ ET AL

By 

Their Attorney, Lisa K. Holthus

Registration No. 60,082

(713) 241-5192

P. O. Box 2463  
Houston, Texas 77252-2463